CONSOLIDATED INFORMATION TECHNOLOGY SERVICES TASK ASSIGNMENT (TA)

1. **TITLE:** (D314) Acoustic Propagation Toolset Development/Validation

TA No:	269-Rev1			
Task Area Monitor:		**Alternate Task Area Monitor:**		None
NASA POC:	**Software Control Class:**			Low Control
Type of Task:	Recurring Task			

2. BACKGROUND

Prediction of aircraft noise (rotorcraft and fixed wing) in the field must account for the affect of the environment (terrain, weather and atmosphere) on acoustic propagation. NASA has several acoustic propagation codes and analyses for predicting these affects. A unified capability is to be developed that includes current ray tracing (straight and curved ray) methods and advanced parabolic equation methods.

DAMAS is an acoustic array processing method that uses deconvolution methodologies. The current implementation of DAMAS was developed for demonstration of the method, but needs refinement to increase efficiency and robustness. In addition there are new developments that extend DAMAS for coherent source applications. DAMAS capabilities allow for identification of specific sources from a complex configuration.

3. OBJECTIVE

Assess current codes and analysis, develop a strategy for a unified capability to integrate within the government aircraft noise prediction suite of tools. Develop and validate a unified, hybrid acoustic propagation tools set for aircraft noise (including rotorcraft as well as fixed wing).

Develop an efficient, robust, documented DAMAS capability that can be used for routine processing as well as a research tool for analysis of acoustic sources.

4. GENERAL IT SUPPORT SERVICES

General IT Support Services Performance Metrics

Performance Standard: Product quality meets customer expectations.

Performance Metrics:

  Exceeds: All deliverables are accurate and meet the requirements and acceptance criteria defined per deliverable.

Meets:	90% of deliverables are accurate and meet the requirements and acceptance criteria. Only minor deficiencies are found that are readily correctable within the development schedule.
Fails:	Deficiencies are found that will result in schedule delays to correct.

<u>Performance Standard</u>: The contractor delivers products (applications, data, etc.) within costs and schedule.

<u>Performance Metrics</u>:

Exceeds:	The contractor delivers products to the customer prior to scheduled delivery date and under cost.
Meets:	The contractor delivers products to the customer on scheduled delivery date and within cost.
Fails:	The contractor delivers products to the customer after scheduled delivery date and/or exceeds stated cost by more than ten percent.

5. SYSTEM AND APPLICATION DEVELOPMENT SERVICES

<u>Project Title</u>: Acoustic Propagation Toolset Development/Validation

<u>LaRC Software Manager</u>:

<u>Software Software Control Class</u>: Low

<u>Responsibilities of Contractor and LaRC personnel</u>:See Requirements

Requirements:
The Contractor shall:

Debug, validate, and demonstrate the accuracy of the Rotorcraft Noise Module (RNM) for relevant test cases including both realistic and idealized noise sources (broadband, narrowband, pure tone). Areas of validation include signal construction/destruction, Doppler effects, flight condition selection (ascent, descent, and hover). In addition, data resolution (propagation grid, acoustic data granularity) will be examined for its effect on the propagation calculation.

<u>Project Title</u>: Integration of Rotorcraft Noise Module (RNM) with Analytical Graphics (AGI) Software

<u>LaRC Software Manager</u>:

<u>Software Software Control Class</u>: Low

<u>Responsibilities of Contractor and LaRC personnel</u>:See Requirements

Requirements:
The Contractor shall:

Wherever appropriate, coordinate and develop the Rotorcraft Noise Module (RNM) for ease of integration into AGI's STK software system. This effort involves coordinated

development of RNM and integration with STK, along with training in the use/design of STK leading to the creation of a hybrid software tool that combines existing features of RNM along with expanded capabilities to include;

Parabolic equation method for noise propagation. This feature will be added in collaboration with personnel at the University of Mississippi and will include logic for determining at runtime when its use is appropriate to the current conditions. The method's effectiveness will be evaluated using relevant available data.

Curved ray path propagation to account for both shadow and caustic regions in the noise footprint. The model's effectiveness will be evaluated using relevant available data.

3-D with time weather effects. Currently, RNM uses a single spatial coordinate model to account for atmospheric effects. The new model will incorporate time as well as three spatial coordinates and will be validated/evaluated with relevant available data.

Enhanced terrain capability. An advanced impedance model will be implemented to better account for varying terrain conditions. Again, the model will be verified/evaluated using relevant available data.

The hybrid method will be validated with Eglin vehicle and source noise data. Determine criteria to guide choice of methods.

Project Title: DAMAS

LaRC Software Manager:

Software Software Control Class: Low

Responsibilities of Contractor and LaRC personnel:The Contractor shall version control the software, and provide documentation and test cases. NASA shall provide the Contractor with access to the DAMAS source code and run time environment.

Requirements:
The Contractor shall:

- Improve the efficiency and robustness of DAMAS-v.0 and DAMAS-C-v.0, including version control and documentation. Validate with data provided by NASA.

- Develop an appropriate test suite for the existing DAMAS codes as well as future versions.

- Develop a unified DAMAS which captures the combined capabilities of DAMAS and DAMAS-C. Validate with data provided by NASA.

- Investigate and develop efficient matrix manipulation methods for DAMAS processing.

- Improve and optimize implementation of DAMAS on distributed memory architectures.

- Develop robust DAMAS processing procedure from start (raw acoustic array data) to finish (final acoustic spectra).

6. **WORK-AREA SPECIFIC SERVICES**

    None required.

7. **Exhibit A**

    None required.

8. **SPECIAL SECURITY REQUIREMENTS**

    There are no special security requirements for performing the requirements of this TA.

9. **SOFTWARE ENGINEERING PROCESS REQUIREMENTS**

    Version control of software, documentation and test cases.

10. **JOINT REVIEW SCHEDULE**

    No special reviews are required.

11. **PERIOD OF PERFORMANCE**

    This TA is effective from 10/01/07 to 04/27/09

12. **TECHNICAL PERFORMANCE RATING**

    In evaluating Technical Performance, quality and timeliness shall be rated as follows:

    Quality: 50%   Timeliness: 50%

13. **RESPONSE REQUIREMENTS**

    This Task Plan shall address the contractor's specific work plans, associated estimated labor hours, cost and schedule.

14. **FUNDING INFORMATION**

    Funding has not been entered for this TA.

15. **MILESTONES**

Date	MileStones
11/01/2007	Six-month review (DARPA)
03/01/2008	Final review(DARPA)
10/29/2008	STK training

16. DELIVERABLES

Number	Deliverable Item	Deliverable Schedule
1	Acoustic propagation toolset (includes highly modified RNM, SAM and audibility codes) will be demonstrated for a variety of atmospheric and terrain conditions using MD902 vehicle and at least one other vehicle selected by NASA.	4/2008
2	An enhanced working copy of the improved RNM code along with instructions/documents/training/test cases necessary for its use.	6/2008
3	Hybrid acoustic propagation toolset with enhanced impedance models, 3-D time dependent weather, propagation methods (ray, PE) and process for method selection.	12/2008
4	Unified DAMAS and documentation, test suite	1/2009
5	Initial Efficiency improvements in DAMAS and streamlining DAMAS processing procedures.	4/27/2009
6	Initial validation of DAMAS and procedures	4/27/2009

17. FILE ATTACHMENTS

None.